

# **Space Charge Effect in Photoemission Spectroscopy**

X. J. Zhou

Dept. of Physics, Applied Physics and SSRL, Stanford University,  
Stanford,  
CA 94305

&

Advanced Light Source, Lawrence Berkeley National  
Lab, Berkeley, CA 94720

We report the observation and systematic investigation of the space charge effect and mirror charge effect in photoemission spectroscopy. When pulsed light is incident on a sample, the photoemitted electrons experience energy redistribution after escaping from the surface because of the Coulomb interaction between them (space charge effect) and between photoemitted electrons and the distribution of mirror charges in the sample (mirror charge effect). These combined Coulomb interaction effects give rise to an energy shift and a broadening which can be on the order of 10 meV for a typical third-generation synchrotron light source. This value is comparable to many fundamental physical parameters actively studied by photoemission spectroscopy and should be taken seriously in interpreting photoemission data and in designing next generation experiments.